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SPECIFICATION FOR CHARTS FOR RECORDING INSTRUMENTS

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Indian Standard

SPECIFICATION FOR CHARTS FOR RECORDING INSTRUMENTS

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Indian Standard

SPECIFICATION FOR CHARTS FOR RECORDING INSTRUMENTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 26 November 1979, after the draft finalized by the Standardization of Industrial Process Measurement and Control Sectional Committee had been approved by the Executive Committee.

0.2 Measuring instruments with the provision for automatic recording of the measured quantity are used for continuous recording of physical parameters that vary with time. Requirements for recording electrical instruments are covered in IS : 6236-1971*.

0.3 This standard is brought out with a view to standardize the requirements of paper charts of the circular and strip type, used in such recording instruments. In addition to covering details of dimensions of charts, perforations and type of markings on charts, to commensurate with the speed of movement of chart, guidelines on packaging and safe transport have been provided in the specification.

0.4 In the preparation of this standard, considerable assistance has been derived from GOST 7826-1963 'Automatic recording thermal and electrical measuring instruments — Charts'. GOST.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements and tests for circular and strip charts for recording various parameters using recording instruments.

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*Specification for direct recording electrical measuring instruments.

†Rules for rounding off numerical values (*revised*).

1.1.1 This standard does not cover the provisions of charts with heat sensitive papers.

2. TYPES AND DESIGNATION

2.1 Types — The charts shall be of the following types:

CAO	Circular types for instruments with pivoting axis of the marking device arm located outside the chart.
CAW	Circular types for instruments with pivoting axis of the marking device arm located within chart.
CRR	Circular types for instruments with rectilinear movement of the marking device radially with respect to the chart.
SRH	Strip types for instruments with rectilinear horizontal movement of the marking device.
SRV	Strip types for instruments with rectilinear vertical movement of the marking device.
SA	Strip types for instruments with movement of the marking device along an arc.

2.2 Examples of Designation

2.2.1 Circular chart for instruments with the pivoting axis of the marking device arm located outside the chart, with diameter of trimmed circumference equal to 200 mm:

Chart CAO 200 IS : 9347-1979 Symbol ....

2.2.2 Strip chart for instruments with rectilinear horizontal movement of the marking device with width of the recording zone equal to 40 mm:

Chart SRH 40 IS : 9347-1979 Symbol ....

NOTE — The symbol code of the chart is determined by the makers of the automatic recording instruments. The symbols consist of figures, letters or their combinations with maximum 10 marks. Charts having the same parameters shall be allotted to one and the same symbol code.

3. DIMENSIONS

3.1 Circular Charts — The main dimensions of the circular charts shall be as specified in Table 1 and as shown in Fig. 1 and 2.

TABLE 1 DIMENSIONS OF CIRCULAR CHARTS

(*Clause* 3.1)

All dimensions in millimetres.

DIMENSIONS	CHART TYPES AND SIZES			
	CAO 160 CAW 160 CRR 160	CAO 200 CAW 200 CRR 200	CAO 250 CAW 250 CRR 250	CAO 300 CAW 300 CRR 300
(1)	(2)	(3)	(4)	(5)
Diameter of the circle along trimmed periphery *D*	160	200	250	300
Diameter of the circle of the margin zone D_1	—	—	240	285
Diameter of the reference circle of the top limit of reading D_2	150	190	230	270
Diameter of the reference circle of the bottom limit of reading D_0	30	40	45	45
Radius of the arc *R* of the reference line of time (for charts of type CAO)	110	140	170	200
Radius of arc *r* of the reference line of time (for charts of type CAW)	70	90	110	130
Diameter of the centre hole *d*	12	12	12	12

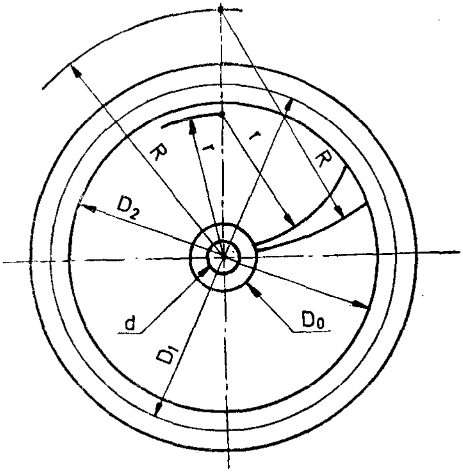

FIG. 1 CIRCULAR CHART, TYPES CAO AND CAW

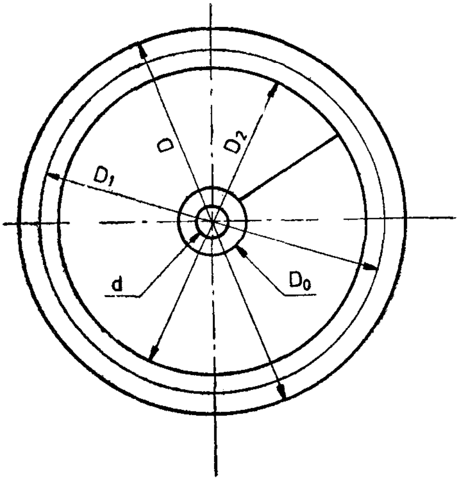

FIG. 2 CIRCULAR CHART, TYPE CRR

3.2 Strip Charts — The main dimensions of the strip charts and width of the recording zone of the drum charts shall be as specified in Table 2 and as shown in Fig. 3.

3.2.1 The dimensions of the strip charts with round perforations on one side shall be as specified in Table 2. The letter ' O ' should be added to the designation of the chart type with one side perforations (for example, SRH O).

3.2.2 The dimensions of the strip charts without perforations shall be as specified in Table 2 (except for dimensions B and b). The width of the strip along the cut shall be $B_1 + 10$ mm (5 mm from each side). The words ' without perforations ' should be added to the designation (for example, SRH without perforations).

4. TECHNICAL SPECIFICATIONS

4.1 The charts for the dotted line and continuous line recording with inks shall be made with backing paper.

TABLE 2 DIMENSIONS OF STRIP CHARTS

(*Clauses* 3.2, 3.2.1 *and* 3.2.2)

All dimensions in millimetres.

DIMENSIONS	CHART TYPES AND SIZES										
	SA 40 SRH 40 SRV 40	SA 50 SRH 50 SRV 50	SA 80 SRH 80 SRV 80	SA 100 SRH 100 SRV 100	SA 120 SRH 120 SRV 120	SA 160 SRH 160 SRV 160	SRH 200 SRV 200	SRH 210 SRV 210	SRH 250 SRV 250	SRH 320 SRV 320	SRH 400 SRV 400
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Width of the strip along edge *B*	50	60	90	120	140	180	220	230	270	350	430
Width of the zone where readings are recorded B_1	40	50	80	100	120	160	200	210	250	320	400
Distance between the centres of perforations *A*	45	55	85	110	130	170	210	220	260	335	415
Width of the perforation zone *b*	—	5	—	—	10	—	—	—	—	15	—
Pitch of the perforations *s*	—	—	—	—	5	—	—	—	—	—	—
Diameter of the perforation holes *d*	—	—	—	—	2	—	—	—	—	—	—
Length of the perforation holes *l*	—	—	—	—	—	4	—	—	—	—	—
Radius of curvature of the perforation holes *r*	—	—	—	—	—	1	—	—	—	—	—
Radius of arc *R* of the reference line of time (for charts of type *SA*	—	110	—	—	120	160	—	—	—	—	—
Length of cut portion l_1	25	30	40	55	65	85	100	105	120	165	200

NOTE — The charts with width of the recording zone 40 and 80 mm shall be made only with round perforations.

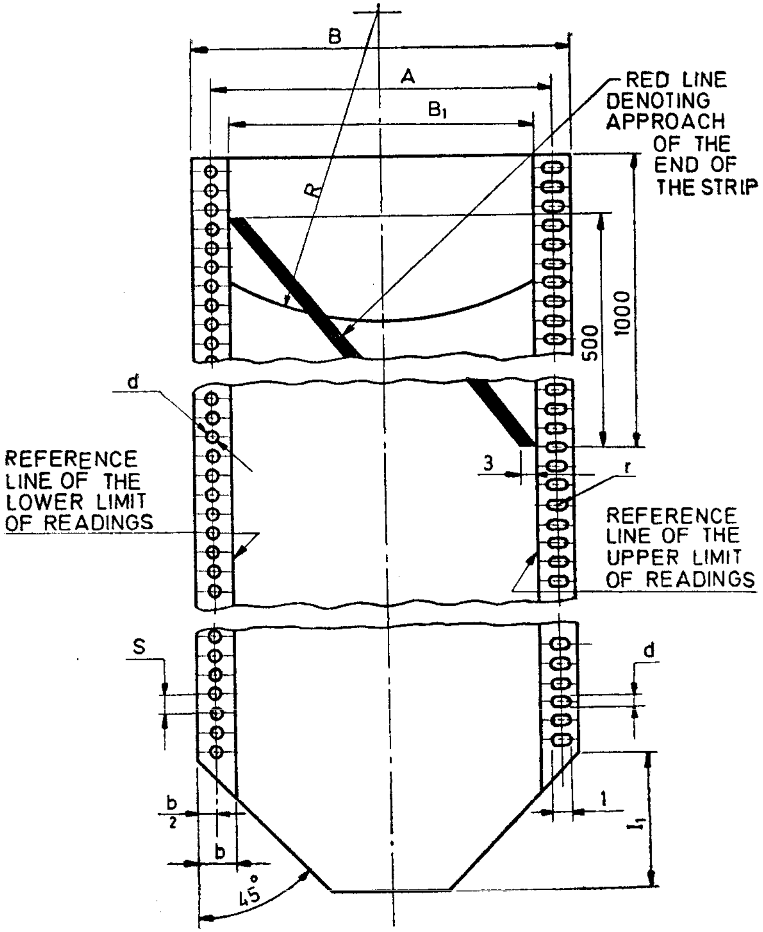
B
A
B1
R
RED LINE DENOTING APPROACH OF THE END OF THE STRIP
500
1000
d
REFERENCE LINE OF THE LOWER LIMIT OF READINGS
3
r
REFERENCE LINE OF THE UPPER LIMIT OF READINGS
S
d
b/2
b
1
l1
45°

Fig. 3 Strip Chart

4.1.1 The paper used in making the charts shall comply with the requirements given in Table 3 when tested in accordance with the relevant test methods prescribed in IS : 1060 (Part I)-1966*, IS : 1060 (Part II)-1960† and IS : 1060 (Part III)-1969‡.

TABLE 3 REQUIREMENTS FOR PAPERS

Breaking Length *Min*		Brightness *Min*	Opacity *Min*	One Minute Cobb-Test *Max*	Wax Pick	Resistance to Feathering
Cross Direction	Machine Direction					
(1) m	(2) m	(3)	(4)	(5)	(6)	(7)
2 000	3 000	68	80	17	No pick on 7*A*	To pass the test

4.2 The circular charts shall be supplied trimmed along the outer diameter and with the centre holes.

4.3 The strip charts shall be supplied in rolls, on spools preferably with inside diameter 12 + 0·5 mm or 18 + 0·5 mm.

The outside diameter of the rolls of strip charts shall be 35 to 80 mm (as desired by the purchaser). The length of the strip in one roll shall be at least 15 m.

The ends of the rolls shall be flush with those of the spool and also flat and perpendicular to the spool axis to within 0·2 mm.

NOTE — This condition does not apply to folding (*harmonic*) charts.

4.4 There shall be no tears, creases, stains or undulations in the charts. The trimmed edges as well as the edges of the holes and perforations shall be clean and smooth without any burrs, tears or crumpling of the paper.

4.5 For making the readings of the parameter, the diagram shall be divided by reference lines *A* in a series of basic intervals (zones). Each basic interval may be subdivided with reference lines *B* into a series of subintervals. Every basic and subinterval shall be divided by reference lines *C* into divisions (*see* Fig. 4A, 4B, 5A, 5B and 6).

NOTE — The Fig. 4A, 4B, 5A, 5B and 6 serve only to show the location of the reference lines *A*, *B*, *C* and the markings and shall not be considered as working drawings for making the charts.

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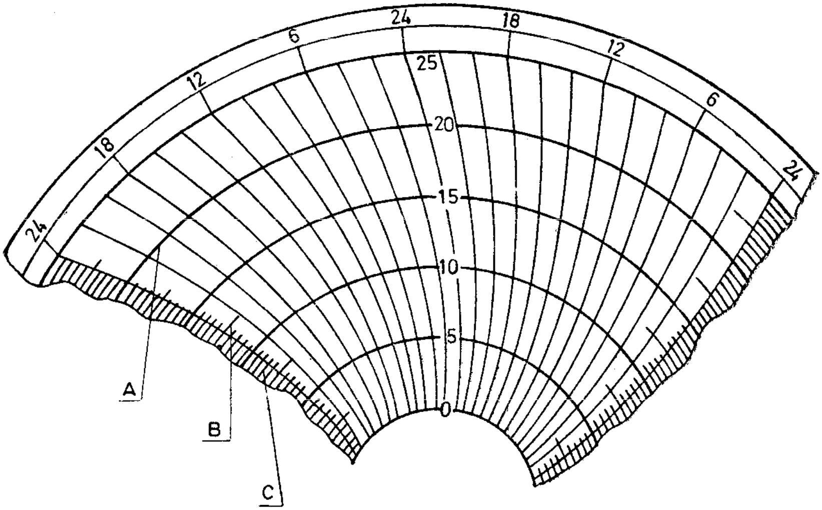
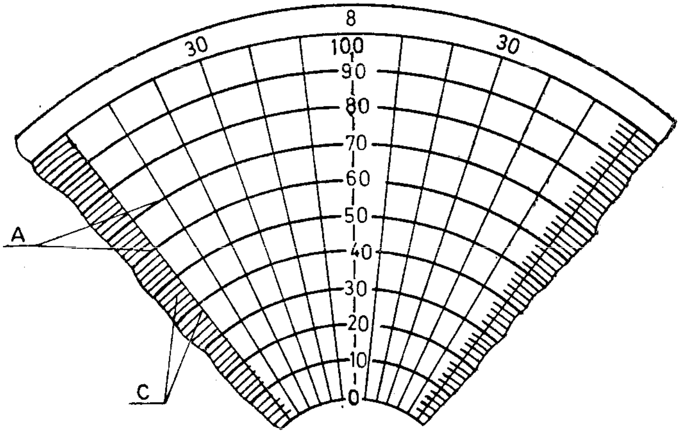
*Methods of sampling and test for paper and allied products : Part I (*revised*).

†Methods of sampling and test for paper and allied products : Part II.

‡Methods of sampling and test for paper and allied products : Part III.

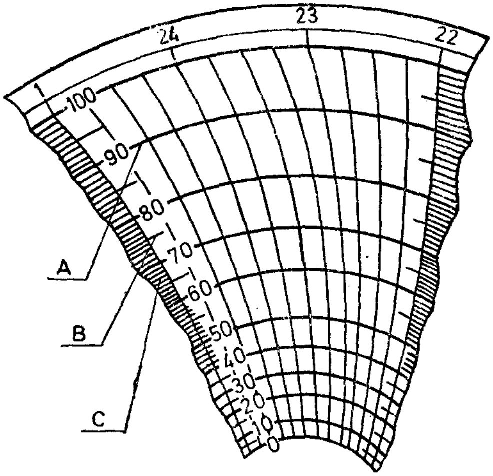


4A Types CAO and CAW

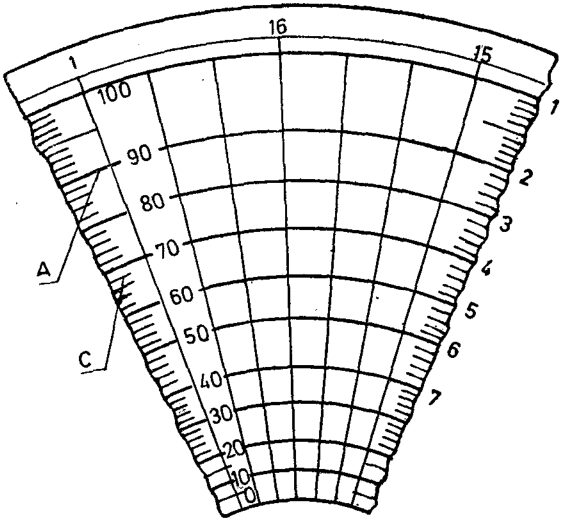


4B Type CRR

FIG. 4 UNIFORM CIRCULAR CHART



5A Types CAO and CAW



5B Type CRR

Fig. 5 Non-uniform Circular Chart

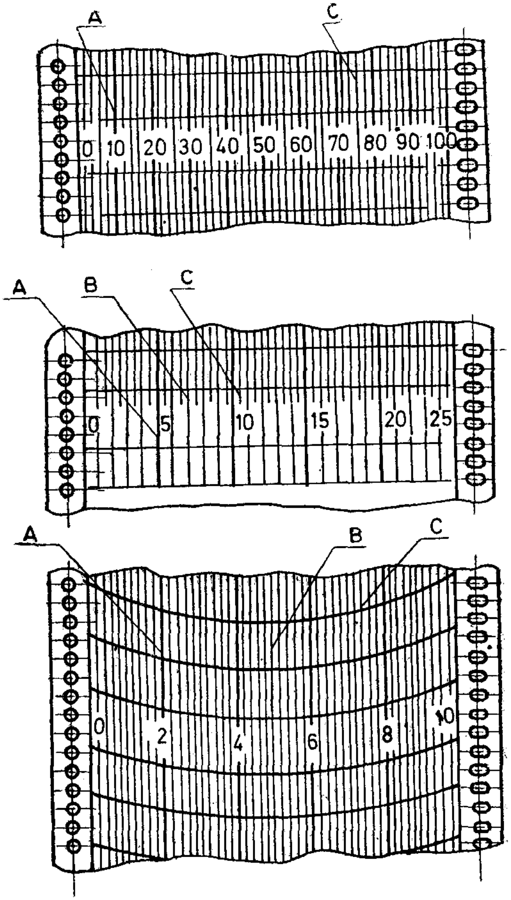


FIG. 6 STRIP CHART LOCATION OF REFERENCE LINES AND MARKINGS (*Continued*)

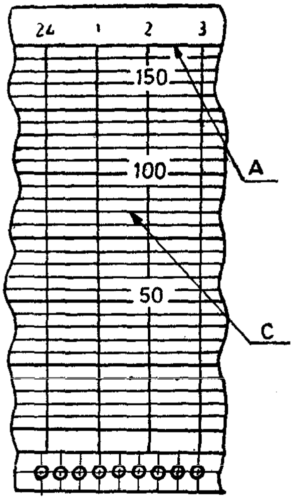


FIG. 6 STRIP CHART LOCATION OF REFERENCE LINES AND MARKINGS

4.6 The number of divisions in the basic intervals of uniform charts shall be the same. In non-uniform charts, the number of divisions may be different.

4.7 In uniform charts without reference line zero, the number of divisions in the first interval may be less than the number of divisions in the other basic intervals. In such a case the numerical values of the lower limit of the reading is plotted with the figures of the smaller value with respect to the figures of the reference lines of the basic intervals.

4.8 In the uniform charts with reference line zero meant to be used in recording instruments with lower measuring limit of 20 percent and more, the initial non-functional section of the chart zone may be reduced. The first reference line of the measured value should be located corresponding to the lower limit of measurement, established for the given type of instrument.

4.9 The values of the divisions and the reading limits of the charts for the indications of the measured parameter shall be according to IS : 3602-1966* and IS : 6236-1971†.

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*Recommendations for the designs of scales and indexes for indicating instruments for scales of 1 to 2 percent resolution.

†Specification for direct recording electrical measuring instruments.

In the case of identical marking of figures for the reference lines, it is allowed to use one and the same chart in the recording instruments of two neighbouring grades of precision. Then the divisions of the chart should be done in accordance with the higher precision grade.

4.10 In uniform charts it is allowed to have conventional marking of figures for the reference lines of the measured parameter from 0 to 100.

4.11 In charts with perforations the reference lines of the lower reading limit shall normally be located beside the round holes of the perforations.

4.12 The numerical values of the measured quantity shall not contain more than four figures. Numbers with more digits shall be shortened by using the coefficient 10 *n* (of the stationary chart), where *n* is any positive or negative integer.

4.13 The numbers shall be located symmetrically with respect to the reference lines and plotted at the line *A*. The condition for the symmetry of the number does not extend to the numerical values of the lower and upper limits of reading of the charts.

4.14 The arrangement of numbers in the circular charts shall be as shown in Fig. 4A, 4B, 5A, 5B and in strip charts as shown in Fig. 6. In the strip charts the numerical values of the measured quantities, marks and inscriptions shall not be located in breaks in the lines and on the lines.

In justified cases, in the circular charts it is allowed to plot numerical values of the measured quantities in the increasing order from the periphery to the centre.

4.15 For reading the time the circular charts shall be divided by *A* lines into basic intervals of time. Each basic interval shall be divided by the *C* lines into divisions of time (Fig. 4A, 4B, 5A and 5B).

The time lines of the circular charts of types CH and CB shall be turned with the bulge in the direction of rotation of the chart.

The rotation of the circular charts shall be clockwise.

4.16 Depending on the duration of one rotation of the circular chart the number of basic intervals of time, the value of minimum divisions of time and the numbers of the reading of the basic intervals of time placed at the lines *A* shall be as specified in Table 4.

4.17 For reading the time the strip charts should be divided over the full extent by the lines *B* into time divisions (Fig. 6). The distance between the lines shall be equal to 10 mm. The time lines shall be located symmetrically with respect to the axis of symmetry of the circular and oval perforations.

NOTE — Within each divisions of time further lines may be drawn subdividing this interval into equal parts.

TABLE 4 CIRCULAR CHART CHARACTERISTICS

(*Clause* 4.16)

Duration of One Rotation of the Circular Chart Hour	Number of the Basic Intervals of Time	Value of the Minimum Division of Time	Numbers of the Reading of the Basic Intervals of Time
(1)	(2)	(3)	(4)
0·1	6	5 sec	1 - 2 - 3 - 4 - 5 - 6
0·5	6	0·5 min	5 - 10 - 15 - 20 - 25 - 30
1	12	1 min	5 - 10 - 15 - 20 - 25 - 30 - 35 - 40 - 45 - 50 - 55 - 60
2	12	2 min	10 - 20 - 30 - 40 - 50 - 1 - 10 - 20 - 30 - 40 - 50 - 2
4	12	5 min	20 - 40 - 1 - 20 - 40 - 2 - 20 - 40 - 3 - 20 - 40 - 4
6	12	5 min	30 - 1 - 30 - 2 - 30 - 3 - 30 - 4 - 30 - 5 - 30 - 6
8	16	10 min	30 - 1 - 30 - 2 - 30 - 3 - 30 - 4 - 30 - 5 - 30 - 6 - 30 - 7 - 30 - 8
12	12	10 min	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12
16	16	20 min	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16
24	24	15 min	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24
168	28	2 hours	6 - 12 - 18 - 24 - 6 - 12 - 18 - 24 - 6 12 etc... with indication in each interval from 24 to 24 of the names of the week days

4.18 The value of the division of time of the strip chart for speeds of movement of the strip of 5, 10, 20, 30, 40, 60, 120, 300, 600, 1 200, 1 800, 3 600, 7 200, 18 000 and 36 000 mm per hour shall be equal to respectively 2; 1; 0·5 h; 15; 10; 5; 2; 1; 0·5 min; 20; 10; 5; 2 and 1 sec.

The numbers of the reading of the intervals of time (1-2-3-4-5-23-24-1-2-3- etc...) shall be marked on the zone of perforations or near it on the recording zone.

For the strip movement speeds indicated above and also for other speeds provided in standards on the various types of instruments, strip charts may be prepared without the numbers of reading of the time intervals.

On charts meant for instruments having more than one strip speeds, the customer may ask for a double row of numbers of reading of the time intervals — one of the basic speeds (20, 40 or 60 mm/h) and an additional one for 10 mm/hour. The lettering of the additional row of numbers shall be smaller than that of the basic row.

4.19 The printing of the charts shall be fast at temperature up to +60°C and relative humidities up to 80 percent; it shall also resist action of inks conforming to IS : 8277-1976*.

4.20 The printing of the charts shall be permanent and clean without smudges and without displacements and shall be uniform throughout. There shall be no break in the lines, lettering of figures.

The reference lines, the numbers for the measured quantities and time as well as the letterings and inscriptions on the chart for dashed line and continuous line recording by ink shall be printed in typographic colour light grey, light-green, blue, light-brown, deep-yellow or light-red colours. The figures, letters and marks shall be of a darker shade than the lines.

The colour of the background, the reference lines, the lines of time, etc, for charts for recording without inks is fixed in the technical specifications on the instruments that have been duly established. The sizes and shapes of figures and letters shall conform to the relevant Indian Standards.

NOTE 1 — The printing of the figures, letters, marks and reference lines may be in black.

NOTE 2 — In the charts the reference lines and figures may be printed in different colours to facilitate reading.

NOTE 3 — The charts may have a uniform shade background of any of the colours prescribed for the reference lines with the reference lines being in white.

NOTE 4 — Charts may be printed on both sides, but then the lines, figures, marks, etc, on the side should not be visible on the other.

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*Specification for water based recorder inks.

4.21 The letterings and figures on the charts shall be according to the basic capital letters.

4.22 The following shall be given on the charts (*see* **6.1**):

a) Manufacturer's/supplier's name or trade-mark (typography);

b) Unit of measurements (only on charts meant for recording specific measured quantities);

c) Graduation (only on charts for instruments with standard graduation);

d) Symbol of the chart and number of this standard;

e) Mark of multiplication and constant of the chart, for example X 10^3 (only on charts with reduced numerical values of the measured quantities);

f) The inscription: ' Instrument No. .... ' ' Date .... ' (for writing by hand, the number of the instruments and the date of taking down the indications); and

g) Length of the roll.

4.23 The letters and inscriptions according to **4.22** on circular charts shall be given on the field of the chart delimited by the reference circumference of the lower limit of indications. They shall be arranged in straight lines perpendicular to the axis passing through the inter-section of the initial reference time line and the reference circle of the upper limit of indications.

4.24 On strip charts the numerical indications of the measured values, the multiplication mark and the chart constant shall be marked at intervals of 70 to 150 mm, and the inscriptions and indications according to **4.23**, except under (e), shall be marked at intervals from 150 to 300 mm.

4.25 In the strip charts the unit of measurement and the chart constant shall be marked at the number of the upper limit of indications and have the same direction as this designation.

4.26 On strip charts on a section 500 mm from the chart end, a red strip of 3 mm thickness shall be marked diagonally to indicate the approach of the end of the chart (*see* Fig. 3).

NOTE — This section should run for 24 hours.

4.27 The thickness of the reference lines and tolerance on the dimension for the circular charts shall not exceed the values specified in Table 5.

TABLE 5 CIRCULAR CHARTS — THICKNESS OF REFERENCE LINES AND TOLERANCE ON DIMENSIONS

DIMENSION AND TOLERANCE (1)	LIMITS (2)	REMARKS (3)
Thickness of lines *A* Thickness of lines *B* Thickness of lines *C*	from 0·40 to 0·50 mm from 0·25 to 0·35 mm from 0·10 to 0·20 mm	On each individual chart the difference in the thickness of a line over its entire length as well as the difference in thickness between any two similar lines shall not exceed 0·05 mm
Tolerance on distance between any two divisions (for same charts)	± 0·2 mm	—
Tolerance on radius of reference circle	± 0·2 mm	—
Tolerance on diameter of centre hole	± 0·15 mm	—
Tolerance on outer diameter of the circle	± 0·5 mm	—
Tolerance for the eccentricity of the centre hole with respect to the centre of the reference circle	0·2 mm	—
Tolerance on the division of time for one division and any interval of time	± 5 minutes (angular)	—

4.28 The thickness of the reference lines and tolerance on the dimensions for the strip charts shall be as specified in Table 6.

4.29 Each lot of charts shall be accepted by the technical control of the supplier (typography). The supplier shall guarantee the compliance of the charts supplied by him to the requirements of this standard.

TABLE 6 STRIP CHARTS — THICKNESS OF REFERENCE LINES AND TOLERANCE ON DIMENSIONS

(*Clause* 4.28)

Dimensions and Tolerance (1)	Limits (2) mm	Observations (3)
Thickness of lines *A*	from 0·35 to 0·45	On each individual chart the difference in the thickness of a line over its entire length as well as the difference in thickness between any two similar lines shall not exceed 0·05 mm
Thickness of lines *B*	from 0·20 to 0·30	
Thickness of lines *C*	from 0·05 to 0·15	
Tolerance on the distance between any two lines (for uniform charts)	±0·2	For the instruments of grades 0·5 and 0·2 the tolerance on the total of the divisions over the entire scale shall be ±0·2 mm
Tolerance on the sum of the divisions over the entire scale	±0·2	
Tolerance on the diameter perforation holes	±0·15	
Tolerance on the length of the oval holes of the perforations	+0·2	
Tolerance on the pitch of the perforations	±0·2	
Tolerance on any sum of pitches of the perforation over a length up to 100 mm	±0·2	
Tolerance on eccentricity of round and oval holes of the perforation	0·2	
Tolerance on the parallelism of the axes of symmetry of the round and oval perforation holes with respect to the time lines (except arcs)	0·2	
Tolerance on the distance between the axis of symmetry of the round holes of the perforation and the reference line of the lower limit of indications, or on the distance from the trimmed edge of the strip to the reference line of the lower limit of indications for charts without perforations	±0·2	
Tolerance on the width of the strip along the trimmed edge	±0·5	

5. PACKING, TRANSPORT AND STORING

5.1 Circular charts shall be packed in cartons, each carton containing at least 100 charts. Strip charts shall be packed in cartons, each carton containing 10 or 20 rolls of the chart; or in wrapping paper. Rolls of 50 pieces of maximum 200 mm width may be packed together.

5.2 The charts in cartons (in packets) shall be packed in wooden boxes for transport. The maximum gross mass shall be 5 kg. The boxes shall be lined on the inside with bituminized paper or other water impermeable material. On each box the figure of an umbrella shall be marked in paint with height 100 to 150 mm and the inscription ‘ Do not throw ’.

5.3 The charts shall be transported in covered wagons. When transported in containers, the charts shall be packed according to **5.1**, protected from moisture and placed in such a manner that they are not displaced.

5.4 The charts shall be kept in heated rooms with relative humidity not exceeding 80 percent.

6. MARKING

6.1 Each carton or packet containing the charts shall have a label (also each roll of strip charts) on which the designation of the chart and the inscriptions according to **4.22**(a), (b), (c) and (d) shall be marked.

6.1.1 If required by the purchaser, the label for the strip charts shall also contain the following markings:

a) Length of the strip in the roll;
b) Inside diameter of spool; and
c) Designation of the chart.

6.1.2 The charts may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. METHODS OF TEST

7.1 Visual Examination — Compliance of the charts with **4.2**, **4.4**, **4.20** and **4.23** shall be verified by visual examination.

7.2 Tests for Paper — The quality of the paper from which the charts are made (*see* **4.1**) shall be tested in accordance with the relevant Indian Standards wherever available. The quality shall be tested on a one metre length piece.

7.3 Fastness of Printing and Action of Ink — The fastness of the printing to temperature and moisture and the action of inks (*see* **4.19**) shall be tested as follows.

7.3.1 In a room with temperature 60 ± 5°C and relative humidity of air 80 ± 5 percent, one circular chart or a section of the strip chart of 1 mm length is kept for 30 minutes. Then, without removing the chart from the chamber, ten lines of thickness 0·4 to 0·5 mm are drawn on it with the pen from an automatic recording instrument and the chart is kept for yet another 15 minutes. Then the chart is removed from the room for examination. The quality of the printing and of the lines drawn with the pen shall not deteriorate.

7.4 Checking of Dimensions — Verification of the dimensions of the chart, thickness of lines *A*, *B*, *C* and tolerances on all dimensions (**4.27** and **4.28**) shall be carried out with a measuring instrument of appropriate precision at 27 ± 5°C and relative humidity 65 ± 5 percent.

7.4.1 The thickness of the lines is verified on any two lines at two points away from each other. The accuracy of marking of the reference lines is tested by a single measurement of the radii and the position of their centres on circular charts and the distances of the reference lines from the zero line on strip charts.

7.4.2 The divisions are tested at least on three sections of the chart delimited by the lines *A* and located in different places of the chart. The perforations of the strip charts are verified at two sections with minimum 1 m distance between them.

INDIAN STANDARDS

ON

STANDARDIZATION OF INDUSTRIAL PROCESS MEASUREMENT AND CONTROL

IS:

1885 (Part XLIX)-1978	Electrotechnical vocabulary: Part XLIX Industrial process measurement and control
2032 (Part XXIII)-1978	Graphical symbols used in electrotechnology: Part XXIII Instruments for process measurement and control
2053-1974	Thermocouple pyrometers (*first revision*)
2054-1962	Reference tables for nickel/chromium-nickel/aluminium thermocouples
2055-1962	Reference tables for platinum/rhodium-platinum thermocouples
2056-1962	Reference tables for copper constantan thermocouples
2057-1962	Reference tables for iron-constantan thermocouples
2711-1966	Direct reading *p*H meters (*revised*)
2806-1964	Methods of temperature measurement by electrical resistance thermometers
2848-1965	Platinum resistance thermometer elements
3624-1966	Bourdon tube pressure and vacuum gauges
3944-1966	Flow cups
4309-1967	Methods of measurement on direct reading *p*H meters
5883-1970	Nickel resistance thermometer elements
6720-1972	Reference tables for platinum/30 percent rhodium-platinum/6 percent rhodium thermocouples
6804-1972	Glass-electrodes for direct reading *p*H meters
7358-1974	Thermocouples
7722-1975	Analogue pneumatic signals for process control systems
7728-1975	Analogue dc current signals for process control systems
7988-1976	Reference tables for chromel-kopel thermocouples
8018-1976	Platinum and platinum alloy wires for thermocouples elements
8457-1977	Tyre pressure gauge for automobiles (pocket type)
8493-1977	Analogue dc voltage signals for industrial process measurement and control systems
8495 (Part I)-1977	Ceramic components for thermocouples and resistance thermometers: Part I Terminal blocks
8525-1977	Recommendations for design of linear scales and indexes for indicating instruments to be read to 0·33-1·25 percent resolution
8784-1978	Thermocouple compensating cables
8824 (Part I)-1978	Electrical moisture meters: Part I For foodgrains
8935-1978	Electric solenoid operated actuators
9319-1979	Electronic self-balancing potentiometric indicators and recorders
9334-1979	Electric motor operated actuators
9347-1979	Charts for recording instruments